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IMAGE PICKUP DEVICE AND METHOD
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[Name of Document] Abstract 1

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[Name of Document] SPECIFICATION

[Title of the Invention]

IMAGE PICKUP DEVICE AND METHOD

[Claims]

[Claim 1] An image pickup device having image pickup means for outputting an image signal corresponding to a subject whose image is taken, and image taking direction switching means for switching the image taking direction of said image pickup means to take images of a plurality of subjects by said image pickup means by switching the image taking direction, said image pickup device comprising:

angle detection means for detecting the angle of the image taking direction; and

storage means for storing the image signal according to the detected angle.

[Claim 2] An image pickup device according to claim 1, further comprising:

image taking direction fixing means for fixing the image taking direction of said image pickup means; and

fixing detection means for finding that the image taking direction is fixed,

wherein said storage means stores the image signal at the detection.

[Claim 3] An image pickup device according to claim 1, further comprising:

driving means for changing the image taking direction of said image pickup means,

wherein said storage means stores the image signal according to a signal for driving said driving means.

[Claim 4] An image pickup device according to claim 1, wherein said storage means stores the image signal when the image taking direction of said image pickup means is switched from a direction for taking an image of a document to a direction for taking an image of a person.

[Claim 5] An image pickup device according to claim 1, wherein said storage means has at least more than two storage areas for storing an image signal, and said image pickup device further comprises:

a trigger switch for storing the image signal input from said image pickup means in said storage means; and

number setting means for setting, in order, the number of the image signal to be stored by said trigger switch;

synthesizing means for synthesizing the set number and said image signal; and

display means for displaying the synthesized image signal.

[Claim 6] An image pickup device according to claim 1, wherein said storage means has at least more than two storage areas for storing an image signal, and switches between said storage areas according to the angle detected

by said angle detection means.

[Claim 7] An image pickup method for outputting an image signal corresponding to a subject whose image is taken and taking images of a plurality of subjects by switching the image taking direction, comprising the steps of:

detecting the angle of the image taking direction; and storing the image signal according to the detected angle.

[Detailed Description of the Invention]

[0001]

[Field of the Invention]

The present invention relates to an image pickup device and method which takes images of a plurality of subjects by switching the image taking direction.

[0002]

[Description of the Related Art]

Conventionally, such a kind of image taking device takes images of a plurality of subjects, such as documents and persons, with a common camera. Therefore, the image taking direction of the camera is switched between a direction for taking an image of a person and a direction for taking an image of a document.

[0003]

[Problem to be Solved by the Invention]

However, once image taking has been switched to take an

image of a person after an image of a document has previously been taken, it is necessary to reset image taking conditions, for example, to turn the light on and to adjust white balance, in order to take an image of a document once again. This operation is very troublesome.

[0004]

Accordingly, an object of the present invention is to provide an image pickup device capable of saving the trouble of taking images of a plurality of subjects by switching the image taking direction.

[0005]

[Means for Solving the Problem]

According to an image pickup device of claim 1 of the present invention, an image pickup device having an image pickup means for outputting an image signal corresponding to a subject, whose image is taken, and an image taking direction switching means for switching the image taking direction of the image pickup means to take images of a plurality of subjects by the image pickup means by switching the image taking direction, comprises an angle detection means for detecting the angle of the image taking direction, and a storage means for storing the image signal according to the detected angle.

[0006]

According to an image pickup device of claim 2, the

image pickup device of claim 1 further comprises an image taking direction fixing means for fixing the image taking direction of the image pickup means, and a fixing detection means for finding that the image taking direction is fixed, and the storage means stores the image signal at the finding.

[0007]

According to an image pickup device of claim 3, the image pickup device of claim 1 further comprises a driving means for changing the image taking direction of the image pickup means, and the storage means stores the image signal according to a signal for driving the driving means.

[0008]

According to an image pickup device of claim 4, the storage means in the image pickup device of claim 1 stores the image signal when the image taking direction of the image pickup means is switched from a direction for taking an image of a document to a direction for taking an image of a person.

[0009]

According to an image pickup device of claim 5, the storage means in the image pickup device of claim 1 has at least more than two storage areas for storing an image signal, and the image pickup device further comprises a trigger switch for storing the image signal input from the

image pickup means in the storage means, and a number setting means for setting, in order, the number of the image signal to be stored by the trigger switch, a synthesizing means for synthesizing the set number and the image signal, and a display means for displaying the synthesized image signal.

[0010]

According to an image pickup device of claim 6, the storage means in the image pickup device of claim 1 has at least more than two storage areas for storing an image signal, and switches between the storage areas for storing the image signal according to the angle detected by the angle detection means.

[0011]

According to an image pickup method of claim 7, an image pickup method for outputting an image signal corresponding to a subject, whose image is taken, and taking images of a plurality of subjects by switching the image taking direction comprises the steps of detecting the angle of the image taking direction, and storing the image signal according to the detected angle.

[0012]

[Operation]

In the image pickup device according to claim 1 of the present invention, an image signal corresponding to a

subject whose image is taken by an image pickup means is output, the image taking direction of the image pickup means is switched by an image taking direction switching means, the angle of the image taking direction is detected by an angle detecting means when images of a plurality of subjects are taken by the image pickup means by switching the image taking direction, and the image signal is stored in a storage means according to the detected angle.

[0013]

According to the image pickup device of claim 2, the image taking direction of the image pickup means is fixed by an image taking direction fixing means, a fixing detection means finds that the image taking direction is fixed and the storage means stores the image signal at the finding.

[0014]

According to the image pickup device of claim 3, the image taking direction of the image pickup means is changed by a driving means and the storage means stores the image signal according to a signal for driving the driving means.

[0015]

According to the image pickup device of claim 4, the storage means stores the image signal when the image taking direction of the image pickup means is switched from a direction for taking an image of a document to a direction for taking an image of a person.

[0016]

According to the image pickup device of claim 5, the image signal input from the image pickup means is stored in the storage means by a trigger switch, the number of the image signal stored by the trigger switch is set in order by a number setting means, the set number is synthesized with the image signal by a synthesizing means, and the synthesized image signal is displayed by a display means.

[0017]

According to the image pickup device of claim 6, switching between storage areas for storing the image signal is done according to the angle detected by the angle detection means.

[0018]

[Embodiments]

The preferred embodiments of an image pickup device and method according to the present invention will now be described.

[0019]

[First Embodiment]

Fig. 1 is a block diagram showing the structure of a document camera as an image pickup device according to a first embodiment. Fig. 2 is a perspective view showing the outward appearance of a document camera 1.

[0020]

The document camera 1 comprises a controller 10 for controlling the whole camera, a trigger switch circuit 15 for allowing an image signal output from an image processing circuit 30 to be stored in an image memory 40, a video camera 20 for taking an image of a document 200a laid on a document table 25, the image processing circuit 30 for sequentially capturing an image signal of the document, which is photoelectrically converted by the video camera 20, and applying signal processing to the amplitude, white balance, frequency characteristics and the like of the image signal, and the image memory 40 to which an output signal of the image processing circuit 30 is input and which temporarily stores the input signal in response to a trigger signal from the controller 10.

[0021]

The document camera 1 further comprises a picture selection circuit 50 to which output signals from the image processing circuit 30 and the image memory 40 are input and which selects a memory image from the image memory 40, a taken image of the video camera 20 from the image processing circuit 30 or a composite image of the taken image and the memory image according to a control signal from the controller 10, an image output terminal 55 for outputting an image signal of the image selected by the picture selection circuit 50 to the outside, and a light 70 for illuminating

the document table 25 and the document 200a laid thereon.

[0022]

The document camera 1 further comprises a switch 65 which opens and closes in response to a control signal from the controller 10, a switch circuit 60 for supplying power to the light 70 depending on the selection through an external operation switch, a memory 80 for storing various set constants of the document camera 1, an angle lock switch 90 mounted on a document angle lock button of the document camera 1, a power receptacle 101, and a power switch 102.

[0023]

Fig. 3 is a perspective view showing a front panel of the document camera 1. In the figure, a front panel 200 comprises a power LED 201 which lights up when the power switch 102 is thrown, and display LEDs 202, 203 and 204 each indicating the state selected by the switch circuit 60. The display LED 202 is an LED for indicating a state in which a contact b of the switch circuit 60 is selected, and the display LED 203 is an LED for indicating that a contact c of the switch circuit 60 is selected, that is, that the light is always shut off. Numerals 205 and 206 respectively denote an LED for indicating an automatic homing state of white balance, that is, a state in which a white balance mode is selected, and an LED for indicating that the white balance is locked in a predetermined state. Numerals 207 to

210 denote a group of LEDs each for indicating a state selected by the output image selection circuit 50. The LED 207 indicates that the video camera is in a person image taking state, and the LED 208 indicates a state in which an output image of the image memory 40 is being output. The LED 209 indicates that a composite image, which is being output, is in picture-in-picture (P in P) form, and the LED 210 indicates that the composite image is in picture-out-picture (P out P) form.

[0024]

The operation of the document camera 1 will now be described. In order to use the video camera 20 as a document camera, an operator puts the power receptacle 101 into a commercial power plug and turns on the power switch 102.

[0025]

The state before the power is turned on is as follows. Since the video camera 20 is used as a document camera, the angle lock switch 90 is locked as shown in Fig. 2 before the power switch 102 is thrown. Therefore, the angle lock switch 90 is in conduction. The contact b of the switch circuit 60 is also in conduction.

[0026]

When power is supplied and the controller 10 is started, the controller 10 determines, based on an H-level

voltage from the angle lock switch 90, that the angle lock switch 90 is in a lock state. Furthermore, the controller 10 reads white balance control data for the document camera, which is previously stored in the memory 80, sends the data to the image processing circuit 30, and sets the white balance at a value for the document camera. At this time, an H-level white balance lock signal is output to the LED 206, by which the LED 206 is lighted up to indicate that the white balance is locked. Since the angle lock switch 90 is on the H-level, the controller 10 closes the switch 65. The light 70 is supplied with power and lighted up.

[0027]

In this state, the operator can give an explanation while taking an image of the document 200a, and store necessary documents in the image memory 40 by pressing the memory trigger switch 15. When the operator finishes image taking of the document 200a and changes the angle of the video camera 20 in order to use the video camera 20 as a person camera, the angle lock switch 90 is released and opened, and therefore, an output signal of the angle lock switch 90 is changed to an L level.

[0028]

In response to the change in voltage of the angle lock switch 90, the controller 10 holds the image signal temporarily stored in the image memory 40, and opens the

switch 65, thereby shutting the light 70 off.

[0029]

The controller 10 releases the white balance lock of the image processing circuit 30 and selects an automatic white balance state. At this time, the LED 206 for indicating that the white balance is locked is shut off, and the LED 205 for indicating that the automatic white lock is selected is lighted up.

[0030]

Next, when the same document is required to be displayed again in this state, during, for example, the process of a conference, the operator can switch an output signal of the picture selection circuit 50 to the image signal of the document stored in the image memory 40 by pressing the memory selection switch of the picture selection circuit 50. Previously stored documents can be displayed, in order, by pressing the memory selection switch 208.

[0031]

When the picture selection circuit 50 is switched to a P in P mode, a picture of a person may be displayed while displaying an image stored in the image memory 40 within the person's picture in reduced size. Alternatively, a picture of a person may be displayed in reduced size within the document image stored in the image memory 40.

[0032]

[Second Embodiment]

An image pickup device and method of a second embodiment will now be described. Fig. 4 is a block diagram showing the structure of a document camera as an image pickup device of the second embodiment, and Fig. 5 is a perspective view showing a front panel. The same components as those in the above first embodiment are denoted by the same numerals, and the explanation thereof is omitted. Numerals 211 and 212 respectively denote a person selection switch for selecting image taking of a person, and a document selection switch for selecting image taking of a document. An LED 213 is lighted up in the person image taking, and an LED 214 is lighted up in the document image taking. An image pickup means driver 221 switches the image taking direction of a video camera 20 corresponding to the document image taking state or the person image taking state. A flip-flop circuit 220 is connected to the document selection switch 212 and the person selection switch 211.

[0033]

In the figures, the document or person image taking by the video camera 20 is selected through selection of the person selection switch 211 or the document selection switch 212 by the operator. The video camera 20 is driven by an electric motor and controlled to point in a document image

taking direction and a person image taking direction.

[0034]

A brief description will now be given to a drive mechanism of the electric motor for switching the video camera 20 to a person camera or a document camera. Fig. 6 is an explanatory view showing the structure of the electric motor. In the video camera 20, a CCD 21 is fixed, and an image pickup lens 22, a mirror 23 and the like are driven by an electric motor 24. In the figure, when the electric motor 24 rotates counterclockwise, an image pickup lens rotating gear 25 also turns counterclockwise and the image pickup lens 22 points down. The mirror 23 is positioned to form an angle of 45° with the optical axis of the image pickup lens 22, and an optical signal incident from the image pickup lens 22 is reflected by the mirror 23 in a right-angled direction, made to enter the CCD 21, and converted into an electric signal (see Fig. 6(A)).

[0035]

When the person image taking selection switch 211 is depressed, the electric motor 24 is rotated clockwise by the controller 10 through the image pickup means driver 221. In correlation to the rotation, the image pickup lens rotating gear 25 turns clockwise, the image pickup lens 22 points in a horizontal direction, and the mirror 23 slides up and comes out of the optical path of the light incident from the

image pickup lens 22. The optical signal incident from the image pickup lens 22 is made to enter the CCD 21 directly, and is converted into an electric signal as an image pickup signal (see Fig. 6(B)). In document image taking, a document camera angle detection switch 26a is turned on by being pressed by the image pickup lens 22, by which the controller 10 detects a document image taking state. In person image taking, a person camera angle detection switch 26b is similarly turned on by being pressed by the image pickup lens 22, by which the controller 10 detects a person image taking state.

[0036]

Accordingly, the controller 10 can judge the image taking state based on a motor control signal, and detect the image taking state by switches. The same control as this is possible in the above-mentioned first embodiment. The video camera may be driven by an air compressor instead of the electric motor. Still further, the electric motor in the camera image pickup device may be controlled by an external computer or from a distant location in a videoconference and the like by adding a data input/output circuit, for example, utilizing RS-232C.

[0037]

[Third Embodiment]

A document camera of a third embodiment will now be

described. Fig. 7 is a block diagram showing the structure of the document camera according to the third embodiment. The same components as those in the above first and second embodiments are denoted by the same numerals. In the figure, numerals 41, 42 and 51 are respectively denote a person image memory, a document image memory, and an output image selector. A switch 52 selects an output image of the person image memory 41, an output image of the document image memory 42 or an output image of an image processing circuit 30 and outputs the selected image to a main screen. A subscreen generating circuit 54 outputs an input image to a subscreen, an adding circuit 56 composes the main screen and the subscreen, and an image selection signal input terminal 310 inputs a selection signal, which selects an output image of the person image memory 41, the document image memory 42 or the image processing circuit 30, from the outside into a controller 10.

[0038]

The operation of the document camera will now be described. In, for example, a simple videoconference where documents are used, pictures of conferees are stored from the image selection signal input terminal 310 in the person image memory 41 in advance of the conference in correspondence to the name of the conferees. An operator projects documents while proceeding with the conference, and

stores the documents in the document image memory 42 as occasion demands. For example, in a device which fixes a document onto a document table 25 by static electricity, it is possible as an application of the above-mentioned embodiment to capture the document into the document image memory 42 in correlation to the turning-on of a switch for generating static electricity.

[0039]

When one of the conferees speaks during the explanation of documents in the conference, the speaker is pinpointed by a means for speaker discrimination, the document image memory 41, in which a freeze-frame picture of the speaker is stored, is directed to output the picture and an output signal is selected by the switch 53. Furthermore, the picture is reduced to about an eighth by the subscreen generating circuit 54, combined with an image of the document by the adding circuit 56, output from an image output terminal 55, and displayed on a monitor or sent and displayed on the other videoconference terminal, by which it is possible to know, in either conference room, who is now speaking.

[0040]

As described above, when the video camera of this embodiment is used in a system, such as a videoconference, a speaker is detected by a speaker discrimination method based

on the volume of a plurality of microphones and the time difference among signals while an image of a document is being projected, and a freeze-frame picture corresponding to the detected speaker, which is temporarily stored in the person document memory 41 in advance, is displayed on a subscreen or in picture-out-picture form through the image selection signal input terminal. This makes it possible to let conferees in the other conference room know who is speaking now, and to achieve a smooth conference with a simple device.

[0041]

[Advantages of the Invention]

In the image pickup device according to claim 1 of the present invention, an image signal of a subject whose image is taken by an image pickup means is output, the image taking direction of the image pickup means is switched by an image taking direction switching means, the angle of the image taking direction is detected by an angle detecting means when images of a plurality of subjects are taken by the image pickup means by switching the image taking direction, and the image signal is stored in a storage means according to the detected angle. Therefore, even if image taking is switched to obtain an image of a person after an image of a document is taken, it is necessary only to output the image signal stored in the storage means in order to

take an image of the document again. Troublesome operations of resetting image taking conditions, for example, turning the light and adjusting the white balance, can be eliminated, and therefore, there is no need to suspend a conference or the like.

[0042]

According to the image pickup device of claim 2, the image taking direction of the image pickup means is fixed by an image taking direction fixing means, a fixing detection means finds that the image taking direction is fixed and the storage means stores the image signal at the finding. Therefore, it is possible to avoid the difficulty of finding that the image taking direction is fixed and to enhance operability.

[0043]

According to the image pickup device of claim 3, since the image taking direction of the image pickup means is changed by a driving means and the storage means stores the image signal according to a signal for driving the driving means, it is possible to avoid the difficulty of driving the driving means, and to enhance operability.

[0044]

According to the image pickup device of claim 4, since the storage means stores the image signal when the image taking direction of the image pickup means is switched from

the document image taking direction to the person image taking direction, it is possible to avoid the difficulty of selecting storage, and to enhance operability.

[0045]

According to the image pickup device of claim 5, the image signal input from the image pickup means is stored in the storage means by a trigger switch, the number of the image signal stored by the trigger switch is set in order by a number setting means, the set numbers are synthesized with the image signal by a synthesizing means, and the synthesized image signal is displayed by a display means. Therefore, display patterns can be improved.

[0046]

According to the image pickup device of claim 6, since switching between storage areas for storing the image signal is done according to the angle detected by the angle detection means, it is possible to avoid the difficulty of detecting the angle, and to enhance operability.

[0047]

According to the image pickup method of claim 7, in an image pickup method for outputting an image signal corresponding to a subject, whose image is taken, and taking images of a plurality of subjects by switching the image taking direction, the angle of the image taking direction is detected, and the image signal is stored according to the

detected angle. Therefore, even if image taking is switched to obtain an image of a person after an image of a document is taken, it is necessary only to output the image signal stored in the storage means in order to take an image of the document again. Troublesome operations of resetting image taking conditions, for example, turning on the light and adjusting the white balance, can be omitted.

[Brief Description of the Drawings]

[Fig. 1]

Fig. 1 is a block diagram showing the structure of a document camera as an image pickup device according to a first embodiment.

[Fig. 2]

Fig. 2 is a perspective view showing the outward appearance of the document camera 1.

[Fig. 3]

Fig. 3 is a perspective view showing a front panel of the document camera 1.

[Fig. 4]

Fig. 4 is a block diagram showing the structure of a document camera as an image pickup device according to a second embodiment.

[Fig. 5]

Fig. 5 is a perspective view of a front panel.

[Fig. 6]

Fig. 6 is an explanatory view showing the structure of an electric motor.

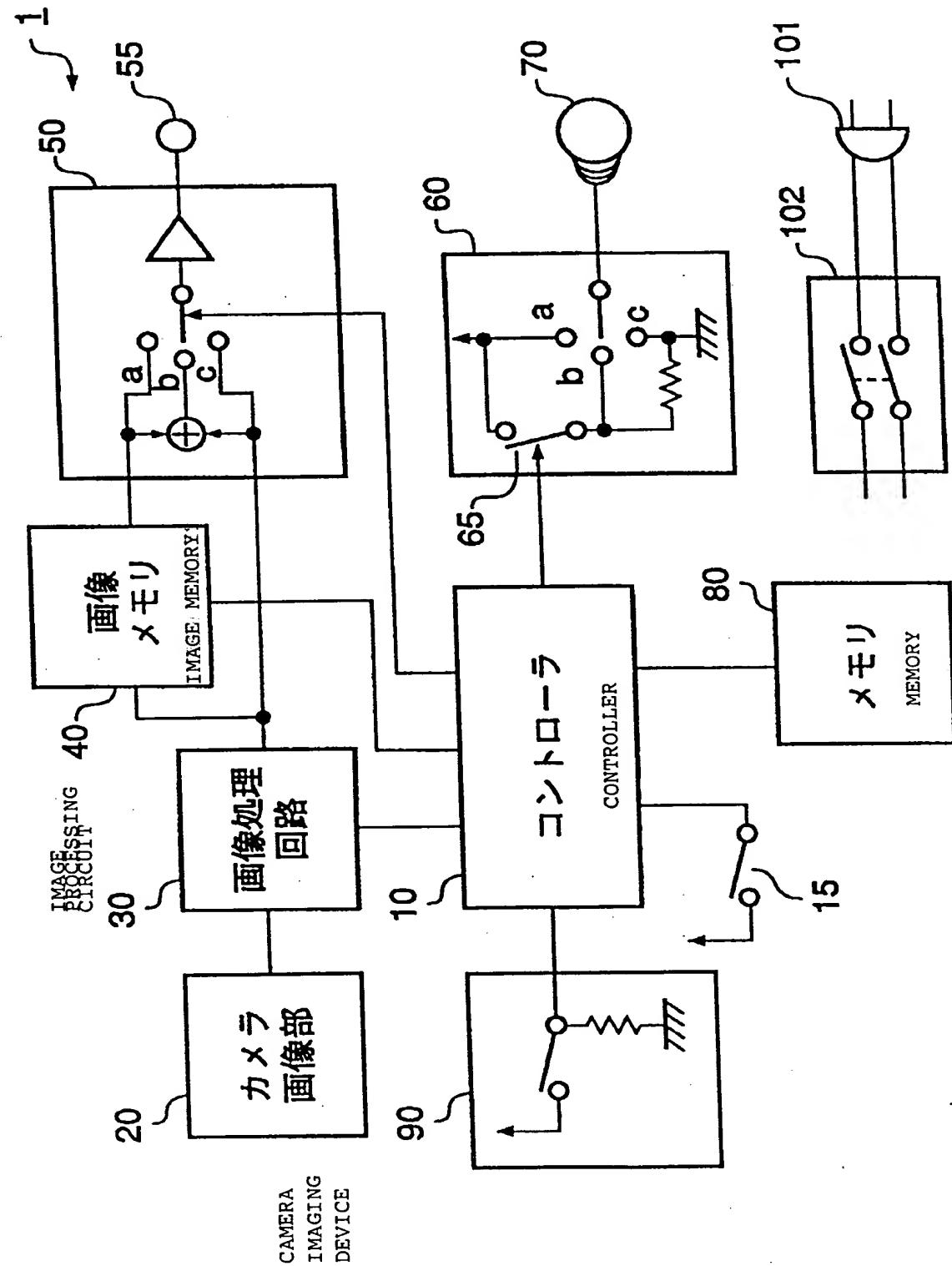
[Fig. 7]

Fig. 7 is a block diagram showing the structure of a document camera according to a third embodiment.

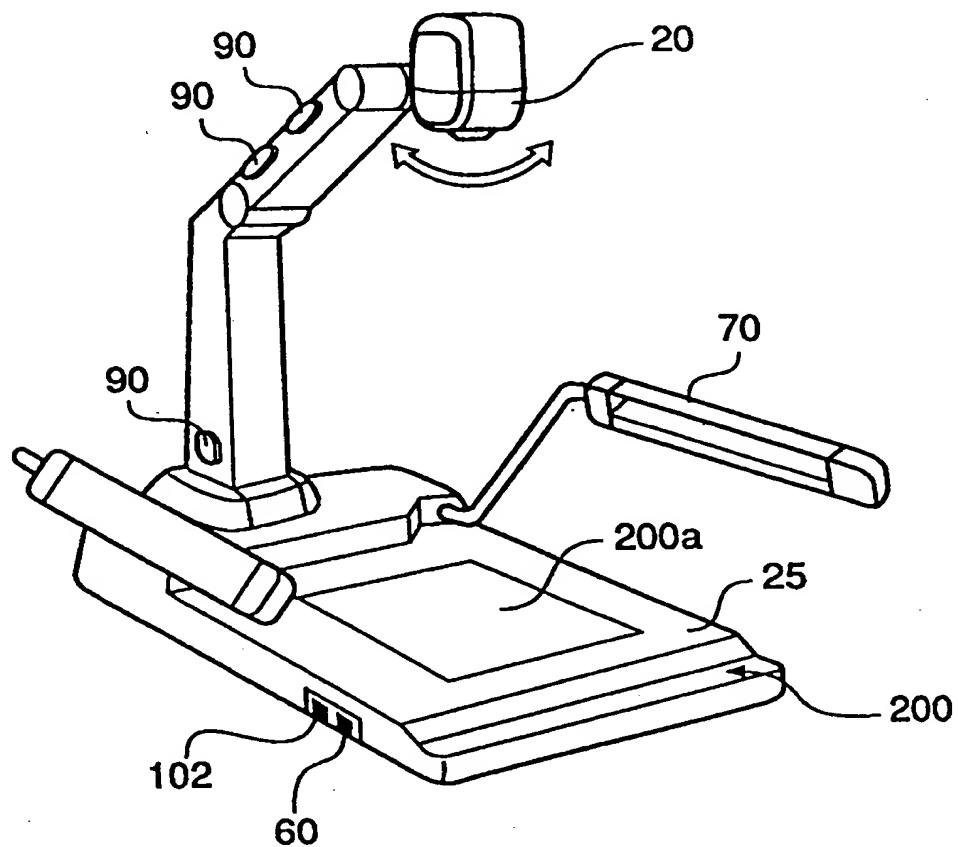
[Reference Numerals]

- 10 ... a controller
- 20 ... a video camera
- 40 ... an image memory
- 41 ... a person image memory
- 42 ... a document image memory
- 90 ... an angle lock switch
- 211 ... a person image selection switch
- 212 ... a document image selection switch

【書類名】 図面
 (Name of Document) DRAWINGS
 【図 1】
 (FIG. 1)

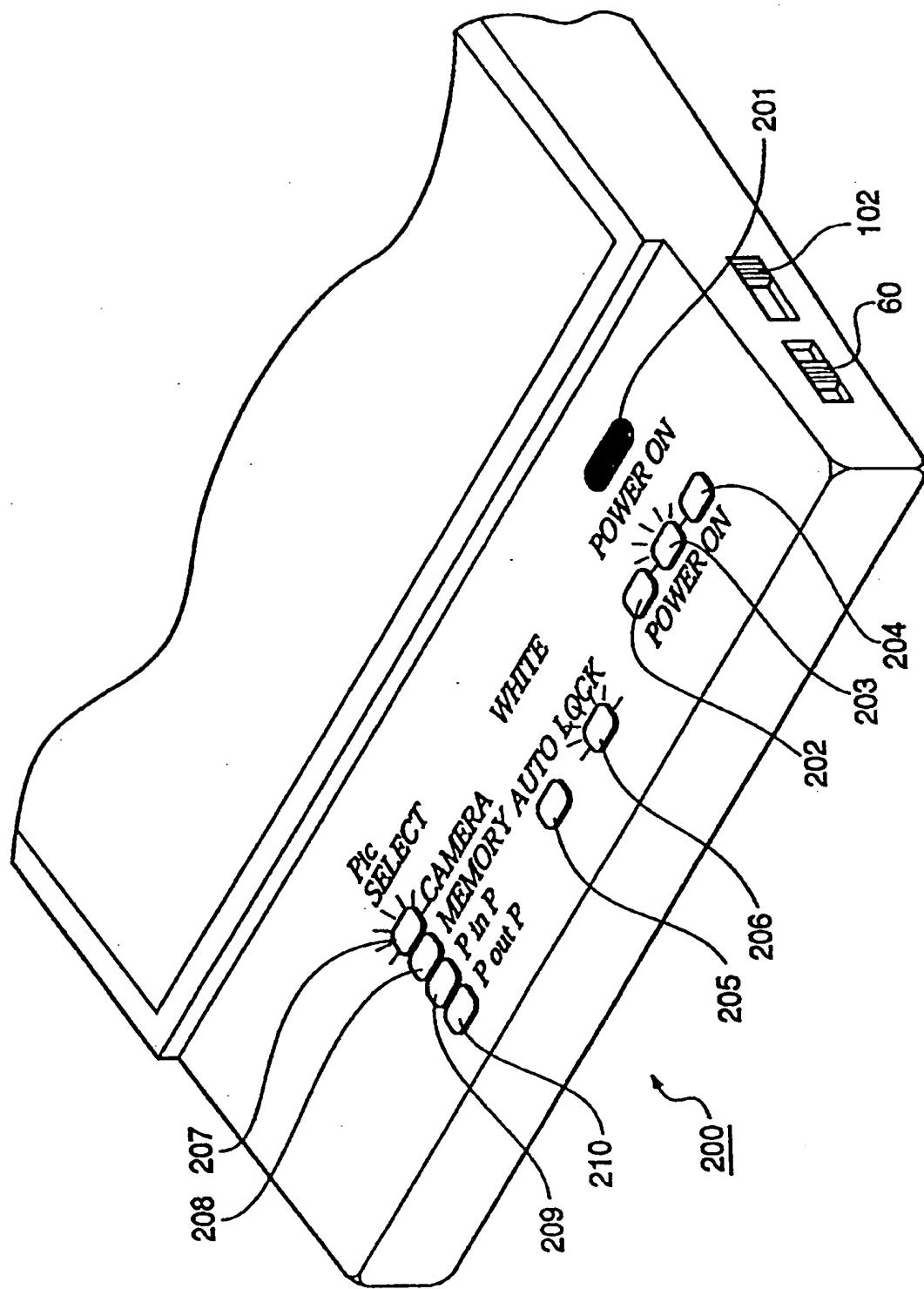


【図 2】
(FIG. 2)

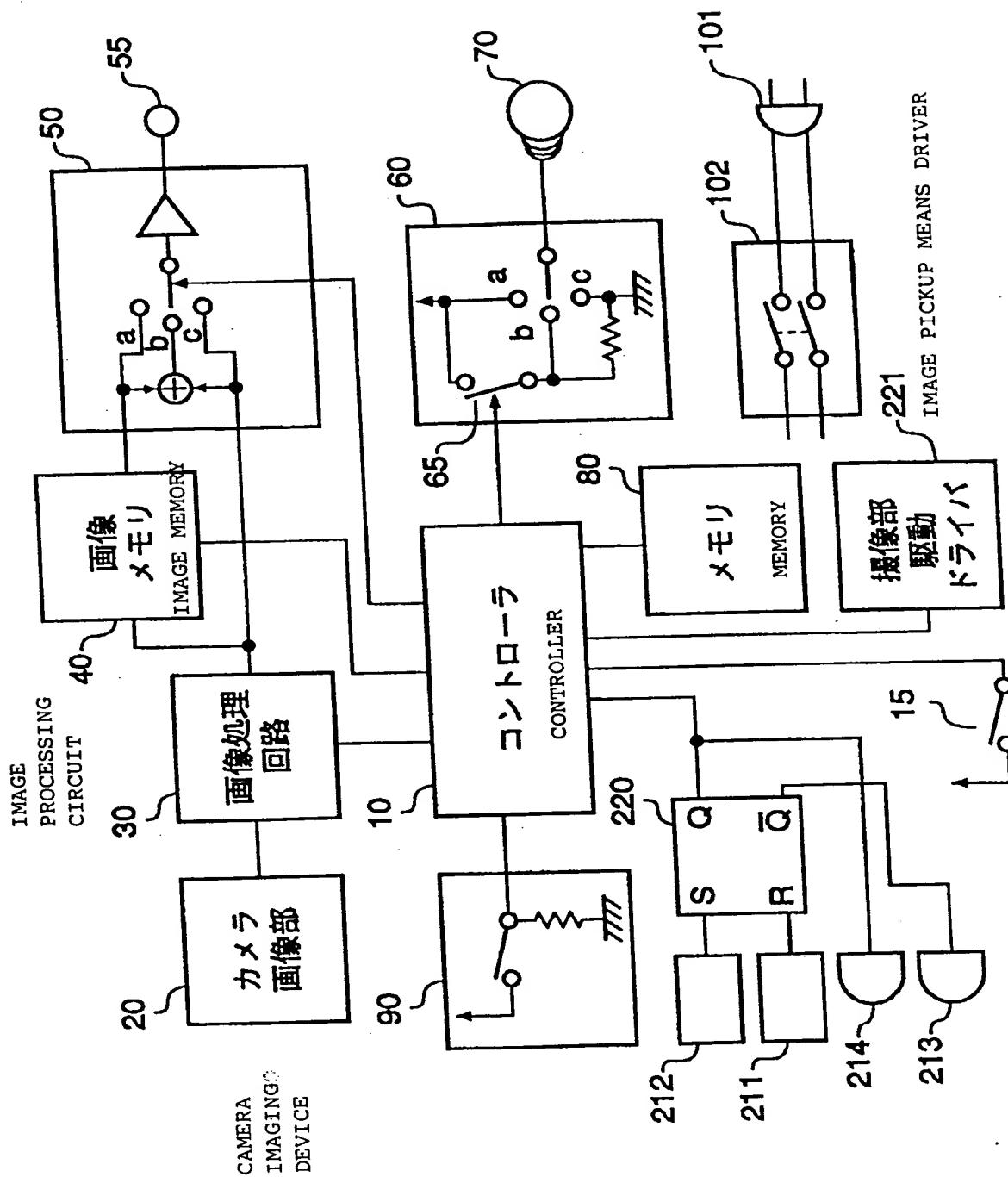


【図3】

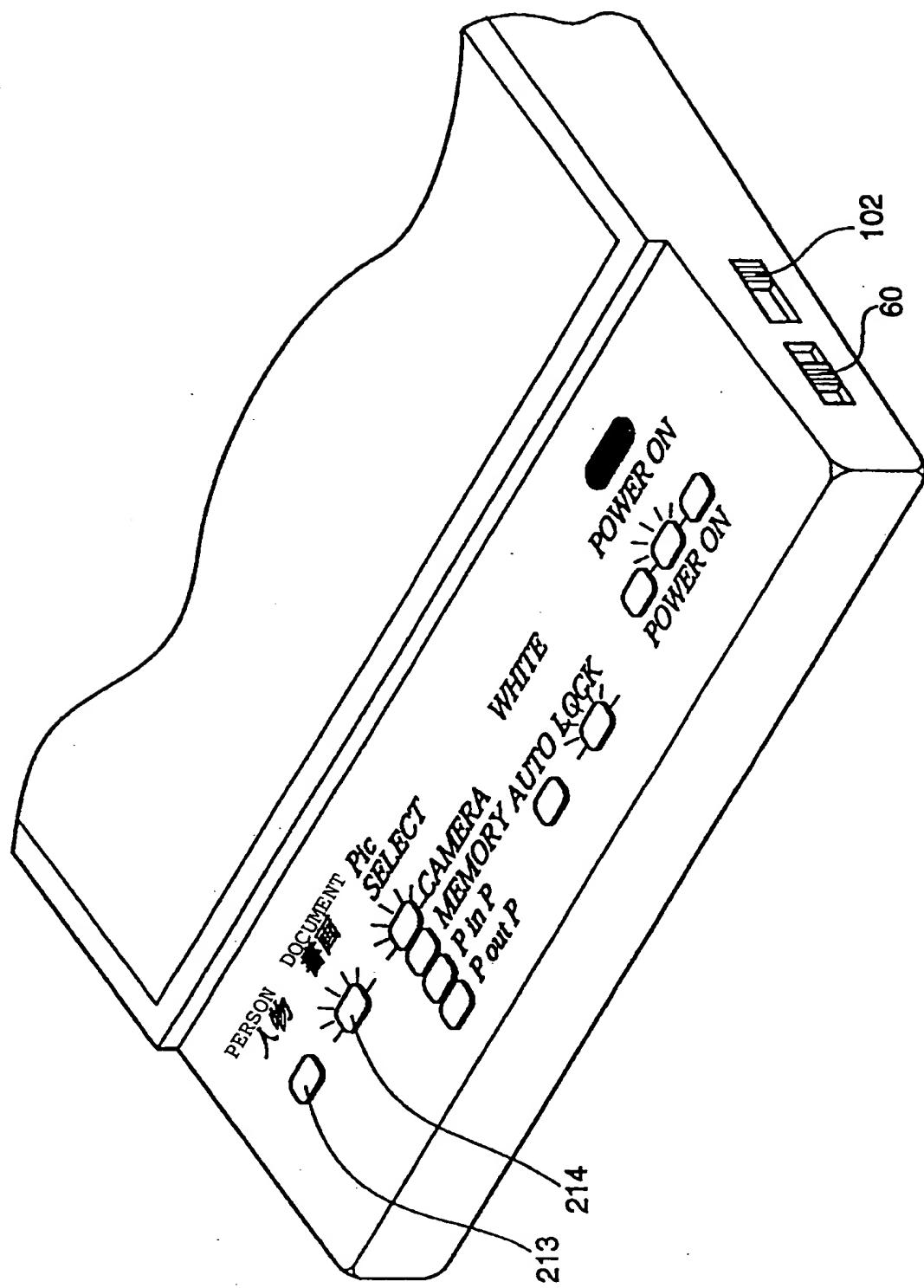
(FIG. 3)

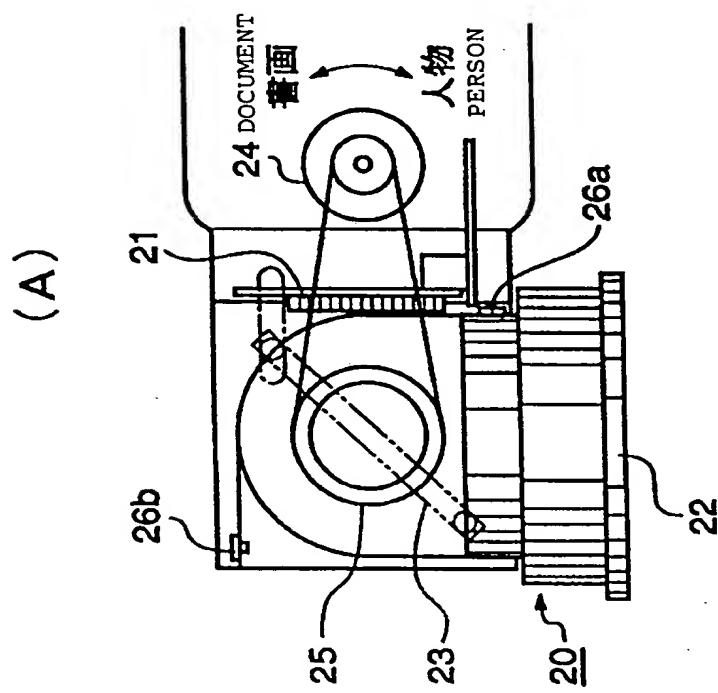
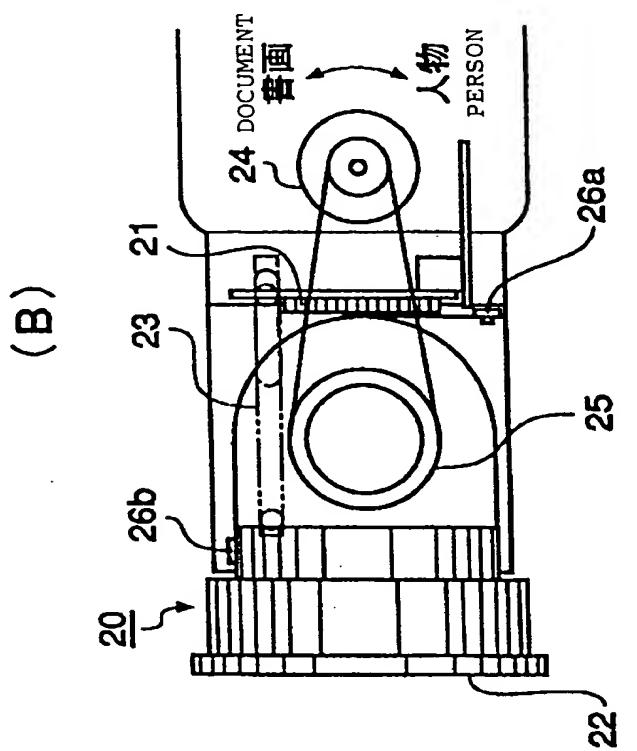


【図4】
(FIG. 4)



【図5】
(FIG. 5)



【図6】
(FIG. 6)

【図 7】
(FIG. 7)

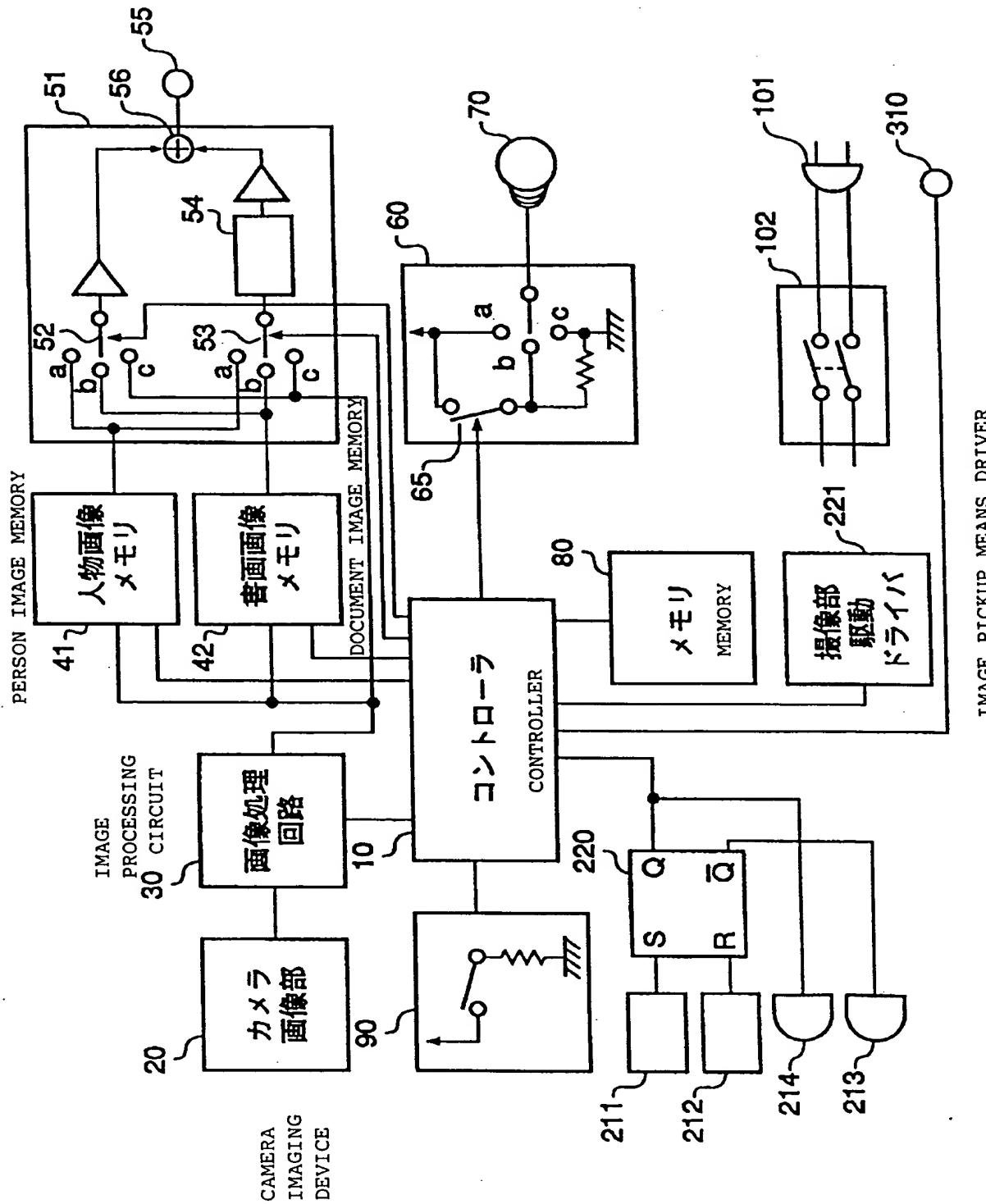


IMAGE PICKUP MEANS DRIVER

[Name of Document] ABSTRACT

[Summary]

[Purpose] To provide an image pickup device capable of saving the trouble in taking images of a plurality of subjects by switching the image taking direction.

[Construction] A document camera 1 comprises a video camera 20, a controller 10 and an image memory 40. In use as a document camera, an image of a document 200a is taken and, if necessary, stored in the image memory 40 by pressing a memory trigger switch 15. In use as a person camera, the angle of the video camera 20 is changed, and the controller 10 holds an image signal input to the image memory 40 and shuts a light 70 off. The controller 10 releases the lock of white balance, and selects an automatic white balance mode. If the same document is required in this state to be displayed again, the image signal of the document stored in the image memory 40 is displayed by pressing a memory selection switch of a picture selection circuit 50.

[Selected Figure] Fig. 1